TOOL HEAD WITH AT LEAST TWO INDEXABLE CUTTING INSERTS

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention concerns a tool head for use in a machine tool, the machine tool having base body, a tool shank adapted to be coupled to a rotating machine spindle projecting axially beyond the base body and two cutting insert receptacles spaced apart in the circumferential and/or in the axial direction for receiving respectively one indexable cutting insert, of which the active main cutting surfaces exhibit deferring adjustment angles relative to the axis of the base body.

Description of the Related Art

[0002] In known machine tools of this type (DE-A-196 05 156), which are designed for finishing valve seat rings and tappet guide bores in cylinder heads, three cutting inserts are provided arranged distributed about the circumference of the base body, wherein one is provided for producing the tight seat bevel for the valve and the other two are provided for producing an inlet and an and outlet protective bevel. The tight seat bevel is associated with a high precision requirement. For producing the three beveled areas, until now three different cutting inserts were employed, which are secured to the tool head by clamping in different positions and orientations. Each of these cutting inserts has a predetermined bevel angle for the associated purpose. In the case of wear then, during tool change-out, care must be taken to ensure that on the appropriate insert receptacle respectively the correct type of replacement insert is introduced. Disadvantages associated therewith include the difficulty of manipulation during change-out of cutting inserts and the high cost of cutting inserts.

SUMMARY OF THE INVENTION

[0003] Beginning therewith, it is the task of the present invention to improve the conventional tool head in such a manner, that the cutting insert costs, which result from wear and changing out, can be reduced, that the manipulation during changing out of the cutting inserts is simplified and that nevertheless a high processing precision is achieved.

[0004] The solution of this task is proposed in accordance with the combination of characteristics set forth in patent claim 1. Advantageous embodiments and further developments of the invention can be seen from the dependent claims.

[0005] The inventive solution is based primarily on the idea, that in the different insert receptacles the same type of indexable cutting insert is provided and that the active main blades of the indexable cutting insert is lengthwise sub-divided into at least two cutting segments aligned with each other, wherein in the indexable cutting inserts in the different insert receptacles respectively only one of the blade segments is effective with it's associated adjustment angle. By this means it is achieved, that the indexable cutting insert during the work process is worn only in the utilized cutting work blade segment such that it can be shifted or reset within the work tool between the different insert receptacles following a predetermined resetting plan or schedule, until all cutting blade segments are worn. Since the indexable cutting inserts can exhibit a multi-corner circumference with multiple cutting edges, the relocation process between the insert receptacles can be repeated for each individual main blade. Thereby there results a substantial reduction in the cost of cutting inserts, which is a function of wear and changing out.

[0006] It is envisioned in a preferred embodiment of the invention that the effective blade segments of the indexable cutting inserts in the various blade receptacles exhibit an axial separation from each other. Thereby it is accomplished that one workpiece is finish-processed simultaneously in three different locations, for example, is provided with a bevel.

[0007] The blade receptacles are preferably provided on preferably adjustable short clamp-holders for indexable cutting inserts, which are rigidly connected with the base body.

[0008] In order to be able to carry out with the work tool head simultaneously a finished processing of valve seat bevels and a tappet guide bore there is further provided, in accordance with a further development of the invention, a reamer located centrally and projecting in the direction of advance beyond the area of the indexable cutting inserts, which in certain cases is displaceable axially relative to the base body.

[0009] It is important for planning or scheduling the resetting, that the indexable cutting inserts in the areas of their main cutting blades bear an imprint marking the individual cutting segments. The imprints are preferably so selected, that the association with the individual insert receptacles is easily recognizable.

BRIEF DESCRIPTION OF THE DRAWINGS

[00010] In the following the invention will be discussed in greater detail on the basis of the illustrative embodiments represented in schematic manner in the figure. There is shown

Fig. 1 a perspective representation of a valve seat - tool head;

Fig. 2 a top view upon the tool head of Fig. 1;

Fig. 3a-c three views of the tool head in the direction of the arrows "A", "B" and "C" of Fig. 2;

Fig. 4a-c detailed segments X, Y and Z from Fig. 3a through c;

Fig. 5a and b a top view upon two indexable cutting inserts with triangular and pentagonal circumference and with marked cutting segments.

DETAILED DESCRIPTION OF THE INVENTION

[00011] The tool head shown in the figure is designed for finish- processing of valve seat rings and tappet guide bores in cylinder heads for internal combustion engines. The tool head **10** is comprised essentially of a base body **12**, a tool shank **14** projecting axially beyond the base body **12** and couplable with a not shown, motor driveable, rotating machine spindle of a machine tool, three short clamp holders **16, 16', 16"** provided spaced apart from each other about the circumference of the base body **12**, which respectively exhibit one insert receptacle **18, 18', 18"** for receiving an indexable cutting insert **20, 20', 20"** and having a centrally located reamer **22** projecting beyond the surface. The reamer **22** is designed for processing a tapped guide bore **24** indicated in Fig. 3a, b and c with a dash-and-dot line for a cylinder head **26** of which a segment is indicated with diagonal line shading. For face milling the valve seat ring **28** of the cylinder head **26** there is used the indexable cutting insert **20** provided in blade receptacle **18** of the short clamp holder **16**. The two further indexable cutting inserts **20'** and **20"** are for production of the inlet protecting bevel **30** and the outlet protecting bevel **32** bordering the valve seat **28**. The reaming of the tappet guide bore **24** and the fine machining of the valve seat ring **28** and the protective bevels **30, 32** occurs for reasons of

centering precision in the one and the same machining step of the workpiece **10**. Accordingly, the indexable cutting inserts **20, 20' 20"** exhibit various adjustment angles in the associated blade receptacles **18, 18' 18"** on their active blade edges **34** in conformance to the individual angles to be machined.

[00012] A feature of the invention is comprised therein, that three indexable cutting inserts **20, 20', 20"** of the same type are employed. The indexable cutting inserts shown in Figs. 1 through 4 exhibit a triangular circumference with an active main blade edge **34** and two passive main blade edges **34', 34"**. By unclamping and rotating by 120° all main blades **34, 34', 34"** can be sequentially brought into the active position.

[00013] A further feature of the invention is comprised therein, that the active main cutting edge or blade edge **34** in the shown embodiment is subdivided into three non-overlapping segments **36, 36', 36"**, of which respectively one is associated with an appropriate blade receptacle **18, 18', 18"** of one of the short clamp holders **16, 16', 16"** (see Fig. 4a, b and c). Of these, the center cutting segment **36** of the indexable cutting insert **20** located in blade receptacle **18** is for production of the valve seat ring **28** (Fig. 4a). It exhibits the smallest adjustment angle α of the three blades of approximately 22°. The cutting or blade segment **36'** in the indexable cutting insert **22'** is associated with blade receptacle **18'** and is exhibits an adjustment angle α' of 45° for producing the inlet bevel (Fig. 3b, 4b). The cutting or blade segment **36"** on the indexable cutting insert **20"** in blade receptacle **18"** exhibits an adjustment angle $\alpha"$ of 60° for producing the outlet bevel (Fig. 3c, 4c).

[00014] By the use of the same type of indexable cutting insert the indexable cutting inserts can in the case of wear also be

exchanged between the short clamp holders **16, 16', 16"**, so that all three blade segments **36, 36', 36"** come into employment as the respective main cutting blade or edge **45**. Thereby the cutting blade costs attributable to wear are reduced to one third.

[00015] In Fig. 5a and b top views of two typical indexable cutting inserts **20'", 20^{IV}** with triangular and pentagonal circumference are shown, of which the main cutting edges are subdivided into three or, as the case may be, two cutting blade segments, indicated with reference numbers **3, 4** and **6**. The there imprinted numbers indicate for example that the active main edge in the associated blade receptacle exhibits a defined adjustment angle for example 30°, 45° or 60°. The imprint upon the cutting blade simplifies manipulation during resetting. In particular, it can be seen with a single glance which of the characterized cutting edges is already worn and which is not. Thereby inadvertent adjustments can be avoided.

[00016] In summary the following can be concluded: The invention concerns a tool head for employment in machine tools with multiple indexable cutting inserts **20, 20', 20"**. The tool head includes a base body **12**, a tool shank **14** projecting axially beyond the base body **12** and at least two blade receptacles **18, 18', 18"** which are spaced apart at least in the circumferential direction for receiving respectively one indexable cutting insert. The active main cutting edge of the different indexable cutting inserts thereby have a differing adjustment angle α, α', $\alpha"$ relative to the base body axis. In order to reduce the blade costs, the same type of indexable cutting inserts **20, 20', 20"** are provided in the different blade receptacles. Besides this, the active main cutting edges **34** of the indexable cutting inserts are subdivided along their length into at least two blade segments **36, 36', 36"** aligned with each other, wherein for the indexable cutting inserts in the various blade receptacles **18,**

18', 18" respectively only one of the cutting segments **36, 36', 36"** is effective with the associated adjustment angle α, α', $\alpha"$.